

S.3 Affected Environment

S.3.1 Land Use

Most of the project area lies within unincorporated King County. The easternmost one-third of Alternatives B and D runs through Kittitas County from the King County border near Snoqualmie Pass to Stampede Pass. A small portion of Alternatives A and C are in the vicinity of two small incorporated cities, Maple Valley and Covington. With the exception of land within those municipalities, local land use planning is under each county's jurisdiction.

Alternatives 1 through 4, B, and D primarily cross forested land that is managed for natural resource conservation (National Forests), watershed protection and/or timber production. For example, two-thirds of Alternatives B and D is located within the boundaries of the Mt. Baker-Snoqualmie and Okanogan-Wenatchee National Forests. Alternatives 1 through 4 cross the Cedar River Municipal Watershed.

Other uses in the vicinity of some alternatives are rural residential development, urban areas, and mineral extraction (aggregate).

Only Alternative A crosses any incorporated land: 3.6 miles within the cities of Covington and Maple Valley.

S.3.2 Recreation

Many recreational resources are located in and around Alternatives A through D. By comparison, there are no recognized recreation sites within the project areas for Alternatives 1 through 4. Even informal, dispersed recreation is minimal around Alternatives 1 through 4 because public access is restricted in the CRW and on private timberlands traversed by these alternatives.

Alternative A crosses Elk Run Golf Course, a public course located on private land and land leased from King County. On land immediately under the ROW and existing line, Maple Valley plans an active recreation area, including ball fields, and bus barn development. Design has been completed and construction will begin soon. Plans include a perimeter trail that would connect to the Cedar River and planned Cedar to Green River Trails (Starbord, 2002).

As Alternative A turns north at Covington Substation, it passes through the city of Covington between Gas Line Right-of-Way Park, which is currently being developed, and the Soos Creek Park and Trail, which is planned to extend into Covington. North of Covington, Alternative A passes between Lake Youngs Watershed and Shadow Lake, then crosses through the Peterson Lake Natural Area and the Cedar River Trail, which connects Maple Valley and Renton along Highway 169 and the Cedar River.

Approximately 22 miles of Alternatives B and D (both Options D1 and D2) cross through National Forest land from the Yakima River east of Keechelus Lake to about midway between exits 38 and 42 on the I-90 corridor. The land allocations assigned to public land in this area show maintenance of recreational opportunities is a primary objective. Acquisition and exchange of land have occurred recently, but there are no plans to add to existing recreational facilities (Rogalski, 2002). Federal recreational resources of note in the vicinity include:

- Alpine Lakes Wilderness Area, located north of I-90 near Snoqualmie Pass, which is currently being analyzed for expansion.
- Pacific Crest Trail, which crosses the existing BPA ROW west of Surveyors Lake and east of the Iron Horse State Park Gate.
- Tinkham Campground, located between existing BPA ROW and I-90, east of exit 42.
- McClellan Butte Trail, with its trailhead at exit 42.
- The ski area at Snoqualmie Pass has ski trails and mountain bike trails that run underneath or adjacent to Alternatives B and D.

The remainder of the length of Alternatives B and D (approximately 14 miles) crosses a mix of public and private land. Though outside the National Forest, this length is located within the Mountains-to-Sound Greenway Trust and a mix of state, federal, and privately funded recreational resources has been established.

Recreational resources outside the National Forest boundary include the following:

- Iron Horse State Park and John Wayne Pioneer Trail, which parallel the I-90 corridor from Rattlesnake Lake through private lands to National Forest lands near Lake Keechelus and the Yakima River. Parts of this converted railroad line trail parallel the BPA ROW and the proposed alternatives cross the trail in four locations. It is managed cooperatively by the Forest Service and State.
- Ollalie State Park, located east of the Upper Twin Falls Trailhead.
- Upper and Lower Twin Falls Trailhead, Twin Falls Natural Area, and Twin Falls Trail, located east of exit 34 along the south side of I-90.
- Camp Waskowitz, with about 40 acres north of the South Fork along I-90 accessed off of 150th and approximately 330 acres south of the South Fork Snoqualmie River. A

portion of the 330 acres extends up to the existing line. Most of the property is used for hiking and outdoor educational sites. Outhouses and “infrequently used shelter houses” are located up along the existing line and some Christmas trees have been planted under the existing line.

- Snoqualmie Valley Trail, which extends from the John Wayne Pioneer Trail and Rattlesnake Lake recreation area down the Snoqualmie River Valley.
- Rattlesnake Mountain Scenic Area, Rattlesnake Mountain Trail, and Rattlesnake Lake Recreation Area. Rattlesnake Lake Recreation Area is more than 1.5 miles south of the existing BPA ROW on Cedar Falls Road off Exit 32. The existing BPA ROW runs along the east side, then passes through the northern end of the Rattlesnake Mountain Scenic Area approximately 0.75 mile south of Snoqualmie Point Trailhead where it crosses the Rattlesnake Mountain Trail.

West of the Rattlesnake Mountain Scenic Area, the existing BPA ROW turns southwest toward Echo Lake Substation after crossing the Rattlesnake Mountain Trail. Here it crosses Weyerhaeuser Real Estate Company land that has been identified for a planned trail connection between the Tiger Mountain State Forest and Rattlesnake Mountain Scenic Area (Konigsmark, 2002).

Alternative C passes just west of Ravensdale Park and along the east side of Big Bend along the Cedar River just north of Kent-Kangley Road. At its north end, this segment crosses Tiger Mountain State Forest.

S.3.3 Geology and Soils

The topography, geology, and soils of the project area are key factors affecting the susceptibility of different areas to erosion and sedimentation. Erosion and sedimentation can cause degradation of water quality and affect fisheries and other habitat.

Topography — The project areas can be subdivided into three *physiographic* provinces: a southern lowland area (Puget Lowlands) in Green Valley and a northern mountainous area, which includes Taylor Mountain, Brew Hill, Rattlesnake Mountain, and the intervening Raging River Valley (Rosengreen, 1965), and the foothills and peaks of the Cascade Mountains. Proportionally, Alternatives A and C encounter more lowland than the other alternatives. The project area for Alternatives B and D, by comparison, is predominantly mountainous.

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Glacial drift — Sand, gravel, boulders, etc., moved and deposited by a glacier or by water arising from its melting ice.

Lowland areas are underlain by **glacial drift**; Alternatives B and D are dominated by volcanic rock.

Geology and Soils — The project area is along the western margin of the South Cascade Range, which are composed primarily of volcanic, volcanoclastic and associated sedimentary rocks that have folded and faulted over the years. Continental glaciers have contributed to the resulting surface deposits and landforms. Soils are typical of those found in the western Cascades of Washington, including soil deposited directly by streams and rivers, glaciers and glacial outwash streams; residual soils (an accumulation of rock debris and soil formed by weathering); colluvial soil transported downslope; and volcanic ash from nearby Cascade volcanoes that mixed with the other soil types.

Seismology — The project area is in a moderately active earthquake region that has been subjected to many quakes of low to moderate strength, and occasional strong shocks, during the Pacific Northwest's 170-year historical record. Recently, the area experienced a 6.8 earthquake centered near Olympia. The seismicity of the region results from the ongoing subduction of the Juan de Fuca Plate beneath the North American Plate along the Cascadia Subduction Zone.

S.3.4 Water Resources

Precipitation — Precipitation patterns in the project area are under the prevailing marine influence of the Pacific Ocean, which produces mild, wet falls and winters, relatively dry summers, and mild temperatures year round. Most of the precipitation falls as rain in the southern lowlands of the project area, while a mixture of rain and snow falls on the upper portions of the northern mountainous area. Annual precipitation in the project area averages between 40 and 60 inches in the Kent area along the western extension of Alternative A, to more than 180 inches at Stampede Pass at the east end of Alternatives B and D. In general, the annual precipitation amounts increase from west to east as elevation increases. There is a distinct wet season; over 75 percent of the total annual precipitation falls between October and April.

Floodplains — The **Federal Emergency Management Administration (FEMA)** has not mapped floodplains for the entire project area, usually doing so only in populated areas. However, FEMA has mapped the 100-year floodplain along the Cedar River a short distance downstream from the project area. Based on this mapping, it appears that the 100-year floodplain just west of the watershed is initially limited to a narrow area along the active Cedar River channel. Farther downstream, however, in the vicinity of Alternative A's northern route, the Cedar River flows into a broad valley where the floodplain averages 1,000 to 1,500 feet in width.

FEMA has also mapped the floodplain of the South Fork Snoqualmie River in the vicinity of North Bend. Here the floodplain is also generally confined to a narrow area along the active channel and appears to have the same geomorphic conditions upstream where Alternatives B and D cross the river twice. FEMA has not mapped the reach of the Yakima River Valley where Alternatives B and D cross the Yakima River. However, the valley is generally broad and flat in this area and several bog areas occur, tending to indicate periodic flooding. Flooding in the Yakima River is controlled to a certain degree by operation of the Keechelus Lake Reservoir, which is about four miles upstream of the proposed river crossing.

Remaining waterways in the project area, including the Raging River and its tributaries, and tributaries to the Cedar and South Fork Snoqualmie rivers, are in moderately incised channels. As such, these streams do not have significant floodplains and flooding generally would not rise above the incised channels.

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Sole source aquifer - An aquifer designated by the Environmental Protection Agency which provides at least half of an area's drinking water.

Groundwater — There are no **sole-source aquifers** designated or proposed by the Environmental Protection Agency (EPA) in the project area. However, there are numerous domestic and public supply wells and wellhead protection programs (City of Kent, City of Covington) located within the project area. The principal groundwater aquifers are in glacial outwash deposits in the southern lowland area. These aquifers are locally developed for domestic and some farm consumption in the communities of Selleck and Kangle. In the northern mountainous area, the community of Halmar Gates, near the end of Kerriston Road, likely uses groundwater for domestic consumption. Wells in this area would produce groundwater from the underlying bedrock. Potential aquifers in alluvium, outwash and ice contact drift deposits also exist between North Bend and Twin Falls State Park along the Snoqualmie River Valley.

Water in the Cedar River, which provides unfiltered drinking water to 1.3 million people, is also partially derived from groundwater sources. As such, contamination of the groundwater could impact the drinking water supplies. Activities in the Watershed that could affect the groundwater supply are strictly controlled.

Water Quality — The project area includes portions of the Cedar River Municipal Watershed, where water quality is very high. Both water quality and quantity are important components of the CRW's ability to provide a clean and reliable drinking water supply. The Cedar River is listed for fecal coliform at points two miles and 10 miles downstream (west) of the Alternatives A and C crossings, respectively. The upper Yakima River is listed as temperature-impaired at a point seven miles downstream from where Alternatives B and D cross it. Two segments of the South Fork Snoqualmie River are listed as pH-impaired at points 1,000 feet upstream from the Alternatives B and D western

crossing and 2,000 feet downstream from the Alternatives B and D eastern crossing.

S.3.5 Fisheries

Each of the transmission alternatives would cross some fish-bearing streams and an unknown number of non-fish-bearing streams.

The fish resources in the study area include resident and anadromous species. Resident species live their life cycles within the watershed. Anadromous species are hatched in freshwater, then spend part of their life at sea before returning to their home waters to spawn.

Along the route of some alternatives, surrounding trees and vegetation produce conditions well suited as **anadromous** fish-rearing habitat. Other streams support only resident fish. Shade produced by forest stands adjoining these fish-bearing streams are often a primary control on water temperature and fish habitat health.

S.3.5.1 Special-Status Fish Species

Special-status fish species include those that are listed, proposed, or candidates for listing as threatened or endangered under the federal ESA, or that are regarded as species of concern by the U. S. Fish and Wildlife Service (**USFWS**), or that are listed as species of concern (including endangered, threatened, sensitive and candidate categories) according to the Washington Department of Fish and Wildlife (**WDFW**).

Federally Listed Species — All transmission alternatives could affect two species of fish listed as either threatened or endangered under the ESA: Puget Sound chinook salmon and Puget Sound bull trout. Alternatives B and D (Options D1 and D2) could affect two additional species of fish, Middle Columbia steelhead and Columbia River bull trout, listed as threatened under the ESA.

Federal Candidate Species — All transmission alternatives could affect one species of fish that is a candidate for listing under the ESA: the Puget Sound/Strait of Georgia **ESU** coho salmon. Although the National Marine Fisheries Service (**NMFS**), in its proposal, found listing to be “not warranted,” the species has not been withdrawn from candidate status and may be listed in the future. Coho salmon are potentially present in streams crossed by each of the transmission alternatives.

Federal Species of Concern — The USFWS has identified the Pacific lamprey and river lamprey as species of concern potentially occurring in the project area. Both Pacific and river lamprey are potentially present in streams crossed by each of the transmission alternatives.

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Anadromous fish — Chinook, coho and sockeye salmon and steelhead trout, which hatch in fresh water, spend part of their life at sea, and then migrate up rivers to their home waters to spawn.

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Evolutionarily Significant Unit (ESU) — A salmon population or group of populations that are substantially reproductively isolated from other conspecific population units, and contributes substantially to ecological/genetic diversity of the biological species as a whole.

Essential Fish Habitat — All transmission alternatives could affect two fisheries protected by federal Essential Fish Habitat (EFH) provisions: the chinook salmon and coho salmon fisheries. All streams in the project area are included in designated EFH for these two fisheries. Some streams are included because they may support spawning, rearing and migratory use by chinook and coho salmon. Others are included because they are situated upstream of areas used by salmon, and the salmon are sensitive to water quality in these streams.

Washington State Special-Status Species — Chinook salmon, bull trout, and river lamprey are state candidates for listing by the WDFW.

National Forest Plan Fish Protection Strategies — The U.S. Forest Service (USFS) manages two National Forests in the project area, the Mt. Baker-Snoqualmie National Forest and the Okanogan-Wenatchee National Forest. USFS also manages lands on the fringes of these two national forests within the project area. In 1993, USFS and the Bureau of Land Management (BLM) developed the Northwest Forest Plan to set guidelines for the management of the natural environment in Pacific Region National Forests. The goals of the Northwest Forest Plan are designed to protect forest ecosystems and allow renewable use of forest material, but they also include protection for riparian areas and waters. As part of the plan, the Aquatic Conservation Strategy (ACS) was developed. This strategy protects salmon and steelhead habitat on federal lands managed by USFS and BLM. The Northwest Forest Plan Standards and Guidelines define the process by which proposed projects are determined to be in compliance with the ACS objectives (ACSOs). If either Alternative B or D (Options D1 or D2) is chosen as the preferred alternative, USFS-managed lands would be involved, and the appropriate level of analysis for ascertaining impacts to ACSOs would need to be completed.

S.3.6 Wildlife

Analysis of wildlife focused on species that are: species federally-listed as threatened or endangered; federal species of concern; USFS “*Survey and Manage*” species, sensitive and proposed sensitive species, *Management Indicator Species (MIS)*, and species of interest; and Washington State-listed threatened, endangered, sensitive or *monitor species*. Species found in the project area include:

Forest Community Dependent Species — A number of forest community species, including invertebrates, were identified as potentially occurring within (e.g., nesting in, foraging in, or traveling through) the project area. These include northern spotted owls, great gray owls, marbled murrelet, black-backed woodpecker, northern

goshawks, merlins, pileated woodpeckers, Vaux's swifts, band-tailed pigeons, blue grouse, fisher, six species of bats, and seven species of terrestrial mollusks.

Riparian Community Dependent Species — Seven riparian community species were identified as potentially occurring within the project vicinity. They include: bald eagle, great blue herons, osprey, willow flycatchers, harlequin ducks, Aleutian Canada goose, mink and Van Dyke's salamanders.

Aquatic Community Dependent Species — Seven aquatic community species were identified as potentially occurring within the project vicinity. These include: the Cascades frog, northern red-legged frog, Cascade torrent salamander, Oregon spotted frog, tailed frog, western toad and Fender's soliperlan stonefly.

Species Dependent on Unique Habitats — Two wildlife species, the Larch Mountain salamander, and the peregrine falcon were identified as potentially occurring within the project vicinity and having a primary association with unique habitat types.

Early Regeneration Community Dependent Species — Three wildlife species preferring young forest surroundings were identified as potentially occurring within the project vicinity: elk, black-tailed deer, western bluebirds, and four species of butterfly.

S.3.7 Vegetation

Vegetation communities found in the vicinity of the transmission line alternatives vary considerably in their general characteristics and species composition. The project area for Alternatives 1 through 4 is almost entirely within forests that have been maintained in timber production for most of the last 150 years. Located further west, Alternative A is generally characterized by highly disturbed, intensely managed vegetation communities typically found in cleared and maintained transmission line corridors and surrounding residential and commercial development. Alternative B is also a highly disturbed, intensely managed transmission line corridor; however, the area immediately adjacent to the corridor is relatively undisturbed and infrequently managed. Alternative C (Options C1 and C2) is typified by moderately disturbed managed vegetation communities typical of rural and suburban development. Alternative D (Options D1 and D2) generally contains vegetation communities with low-to-moderate disturbance and low management intensity.

Vegetation cover types were determined by the type of dominant plants (e.g., tree, grass, shrub), the species of dominant plants (e.g., Douglas fir, alder, and maple), and the regeneration stage of a given forested stand. For Alternatives 1 through 4, vegetation cover types in the CRW HCP database were reviewed and consolidated into 12

categories. The vegetation along Alternative A is dominated by rural-residential and suburban development cover types, and by the managed shrubland communities typical of existing transmission line corridors. For Alternatives B and D (Options D1 and D2), analyses of existing vegetation communities were based on USFS stand data, resulting in six additional categories for mature forests and managed rural-residential areas. The vegetation for Alternative C, particularly Option C1, presents an intermediate condition between development-dominated Alternative A and the forest dominated Alternatives 1 and D (Options D1 and D2). The rural residential managed cover type is most prevalent of any cover type along Option C2.

The **Proposed Action** (Alternative 1) — is dominated by coniferous forest stands in the mature coniferous regeneration cover type. The north leg of the Proposed Action tends to be mixed coniferous-deciduous forest. The south leg of the Proposed Action has more conifer-dominated stands. A thin riparian strip along the Raging River contains several large old conifers, including Douglas fir and western red cedar trees over 35 inches diameter breast height (dbh).

Alternative 2 — is dominated by coniferous forest stands in the mature coniferous regeneration cover type. The extreme southern end of Alternative 2 passes through a young Douglas fir plantation. Alternative 2 also passes through young Douglas fir plantations just southeast of the point where it joins Segment D along the existing transmission line ROW (see Map 8 for segments on Alternatives 1-4).

As with the Proposed Action, the portion of Alternative 2 that follows Segment D tends to have more mixed forest to the west and more conifers to the east. This alternative crosses a thin stand of older Douglas fir and western red cedar at the Raging River.

Alternative 3 — generally passes through older, more mature coniferous regeneration and mid-regeneration coniferous stands, and less non-forested area. There are no mature deciduous stands. The project area of Alternative 3 includes approximately six acres of wetlands and numerous cover types in the lakes/rivers/streams category.

At least two older, mature Douglas fir stands were found during field studies for Alternative 3. These were off Pole Line Road near Taylor Creek and along Binus Creek Road. Trees in these stands were over 32 inches dbh and averaged 160 feet in height. Increment cores from these trees showed these stands to be over 70 years old.

Alternative 4A — is dominated by mature coniferous regeneration cover type. This alternative also crosses the same young Douglas fir plantation that is crossed at the south end of Alternative 2. Most of the younger stands within the project area were found along Segment D,

toward the north end of the alternative. The areas north of Selleck and Pole Line Road, where Alternative 4A crosses from Segment E to Segment C, are dominated by mature coniferous regeneration stands.

Alternative 4B — is dominated by mature coniferous regeneration forest cover type. It is similar to Alternative 4A in that it begins in a young, Douglas fir plantation, then passes through older coniferous areas before joining Segment D. From there, stand age tends to drop and cover type becomes more mixed forest.

Alternative A — is dominated by rural-residential and suburban development cover types, and by the managed shrubland communities typical of existing transmission line corridors. Over 40 percent of Alternative A's study area is in developed or rural-residential cover types. Less than a quarter of the area is in conifer-dominated forest. Of the coniferous forest present, most is less than 35 years old, and conifers up to 75 years old dominate only 4 percent of the total study area. While remnant older trees are likely present in the Alternative A area, no stands were identified that are dominated by trees older than 75 years.

Alternative B — lies within the existing transmission line corridor that extends westward from Stampede Pass to Echo Lake Substation. In the eastern two-thirds of Alternative B, vegetation communities adjacent to the existing corridor are dominated by coniferous forest stands. Most of these are mature stands, especially near the eastern end of Alternative B.

Within the portion of Alternative B cleared for operation and maintenance of the transmission line, vegetative cover types are dominated by managed shrublands and patches of managed early regeneration coniferous stands. Most of the young regenerating conifers are Douglas fir. In higher elevations (generally above 3,500 feet), Pacific silver fir seedlings that have volunteered from adjacent mature stands are also present. Since no transmission line is currently hung from the south side of the tower arms, the need to keep that side of the corridor cleared has not been as great as on the north side of the ROW. As a result, most of the young coniferous regeneration stands in the ROW are found along the southern edge of the transmission line corridor.

Alternative C (Option C1) — presents an intermediate condition between the development-dominated Alternative A and the other forest-dominated alternatives. Total developed and rural residential area is under 25 percent, and forested communities of any kind account for approximately two-thirds of the project area. However, as with Alternative A, conifer-dominated communities within the

Option C1 area are primarily young stands under 35 years old. Mid-regeneration coniferous stands (20 to 35 years old), mid-regeneration mixed stands (10 to 30 years old), and early regeneration coniferous stands (less than 20 years old) account for 31 percent of the study area. Rural residential managed landscape has the highest percentage cover of any type.

Alternative C (Option C2) — shares the northern portion of the Option C1 alignment and so has similar percentages of cover types: total developed and rural-residential areas account for 25 percent; forested communities of any kind cover about two-thirds of the project area; and rural residential managed landscape has the highest percent cover of any type. Conifer-dominated communities are primarily young stands under 35 years old. Mid-regeneration coniferous and mixed stands, and early regeneration coniferous stands account for 34 percent of the study area.

Alternative D (both Options D1 and D2) — passes through National Forest land managed by the Okanogan-Wenatchee and Mt. Baker-Snoqualmie National Forests from Stampede Pass heading west toward North Bend. Vegetation within the area of this alternative is 86 percent forested, with 61 percent of the area in coniferous forest. Options D1 and D2 contain the oldest and largest conifer stands of all the alternatives. Almost 18 percent of the conifer stands are in the range of 75 to 250 years in age, and another 18 percent are approaching 75 years old. Development and rural residential areas account for less than 6 percent of the study area.

The area around Echo Lake Substation is grass/forb/shrub, with small mixed coniferous-deciduous stands. The perimeter area to about 100 feet around the substation is surrounded by gravel and non-native grasses.

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S.3.8 Wetlands

Wetlands perform many important functions, including flood storage and flood flow moderation, filtering pollutants and sediments before they enter streams, and providing foraging, breeding, cover, and rearing habitat for many wildlife species.

A total of 90 wetlands were identified within the ROWs of the transmission alternatives. Wetland vegetation classes include palustrine emergent, scrub-shrub, open water, riverine, unconsolidated bottom and forested wetlands as defined by Cowardin et al. (1979).

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Depressional areas — Wetland areas that receive water from overland runoff and precipitation.

Commonly these wetlands are associated with **depressional areas** that receive water from overland runoff and precipitation. They are generally greater than 1 acre and include a mosaic of wetland and upland areas following small variations in topography. Several wetlands were also found to be associated with the riparian area of **low-gradient** streams. Wetlands east of Snoqualmie Pass are generally associated with riparian fringes and floodplains of streams. Hydrology of these wetlands depends on stream flows and flooding. Just west of Snoqualmie Pass, wetlands are predominantly located on sloped areas and were fed by groundwater discharge seeps.

Wetland buffers inside the Cedar River Watershed, private timberlands and National Forests are generally intact and dominated by a mix of shrubs and young forest. Wetland buffers within existing power line ROWS have been cut to allow conductor span, and generally have low shrub and herbaceous cover. Wetland buffers in the more urban areas (Alternatives A and C [Options C1 and C2]) typically consist of grasses, shrubs, or trees.

Common dominant wetland plant species include red alder, western hemlock, willow, salmonberry, Douglas' spiraea, soft rush, creeping buttercup, skunk cabbage, piggy-back plant, and slough sedge.

S.3.9 Visual Resources

The visual project area includes numerous landscape types, including the Cedar River Municipal Watershed, private timberlands, National Forest land, rural residential uses and pastureland in unincorporated communities, and some limited higher density uses in incorporated areas.

S.3.10 Socioeconomics

The project area is located within rural areas of King and Kittitas counties and the incorporated cities of Covington and Maple Valley. Other cities near the project area are North Bend, Snoqualmie and Black Diamond. The routes of most alternatives pass predominantly through forested areas with little population, although there are varying degrees of rural residential and/or denser residential use along each route.

King County is the most populated county in Washington. King County and the state have both experienced substantial increases in their populations since 1960, with growth rates exceeding the national average. Although population growth experienced by King County has been rapid, the state as a whole has been growing at an even faster rate. The average annual covered wage in King County of \$47,000 was above the state average annual covered wage of \$37,000 in 1999, the

latest information available. Average annual covered wage in Kittitas County was \$22,400, significantly lower than the state annual coverage wage. Household income in the incorporated communities near the project alternatives had fewer households below the poverty level than did King and Kittitas counties as a whole. Eight percent of King County residents and almost 20 percent of Kittitas County residents fell below the poverty level in 1999, the latest information available. This compares to 6.5 percent in North Bend, 4 percent in Covington, and 1.7 percent in Maple Valley.

The ethnicity of the project vicinity is predominantly Caucasian and the remainder primarily African-American, American Indian, Pacific Islander, and Asian. King County as a whole has a higher minority population (greater than 20 percent) than does Kittitas County (11 percent). The project vicinities all have lower percentages of minorities than their respective counties.

The main economic activities in King County are manufacturing, shipping and trade, agriculture, business services, shipbuilding, fishing, wood products, and tourism. Total employment in King County has grown gradually over the past six years. King County has consistently had lower rates of unemployment than the statewide average during the last decade. Employment in King County is nearly one-third in services, slightly higher than the distribution of employment for the state of Washington as a whole, with nearly 28 percent of all jobs in the state attributable to the services sector. This sector is dominated by the business services industry, which accounts for nearly one-third of King County's services sector jobs. Government employment is the dominant sector in Kittitas County.

S.3.11 Cultural Resources

The project area is rich in cultural history. Portions of the project area have been and continue to be used traditionally by members of many Indian tribes. Members have used the area for camping, fishing, hunting, gathering berries, trading with other tribes and as a traveling route. BPA has asked potentially affected tribes to identify tribal concerns about potential **traditional cultural properties (TCPs)** (locations that may not contain physical remains, but hold heritage importance for their association with cultural traditions) within the project area. The corridors for Alternatives B and D, for example, contain previously identified TCPs near Rattlesnake Mountain and in the Snoqualmie River drainage. Another traditional cultural use site, Lookout Mountain, occurs within the Cedar River Watershed, but is more than one mile from any of the alternatives (SPU 1999:3.6-4).

Other existing cultural resource sites, prehistoric and historic, described in various records and literature were researched. No

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Traditional Cultural Properties
A traditional cultural property is defined generally as one that is eligible for inclusion in the National Register of Historic Places because of its association with cultural practices or beliefs (e.g., traditions, beliefs, practices, lifeways, arts, crafts, and social institutions) of a living community that are rooted in that community's history, and are important in maintaining the continuing cultural identity of the community.

registered historic sites – structures or districts – are located within a quarter mile of the proposed ROW for each alternative, although three are located within one mile of one or more of the alternatives. The Selleck National Historic District, for example, is the closest cultural resource site and is separated from Alternative 2 by a road and more than 700 feet.

Of the cultural resources identified through archival and map research, only the former Barneston townsite (including Hemlock and the related Japanese settlement) and the Pedro Felise cabin (no longer standing) occur on or within the 150-foot right-of-way of BPA's proposed alternative routes. The probability for encountering prehistoric cultural resources along any of the four action alternatives varies by landform and increases along the Cedar River.

There is a high probability of encountering historic-period cultural resources in the project area, such as remnants of historic-period logging activities. Many historic-period cultural resources have been identified in archival sources and maps, although few have been formally inventoried or even verified on the ground by cultural resource professionals.

S.3.12 Noise, Public Health and Safety

S.3.12.1 Transmission-line Noise

Audible noise — usually characterized as a hissing, crackling sound sometimes accompanied by a hum — can be produced by transmission lines. Usually this happens during foul weather which, based on meteorologic records near the route of the proposed transmission line, is expected to occur less than 9 percent of the time.

Along the alternative routes of the proposed 500-kV transmission line, existing noise levels depend on land use and on whether there is an existing transmission line. Background noise levels in remote areas depend on ambient conditions: wind, rain, traffic or other human activity nearby. For example, levels associated with rain on foliage will be up to 50 dBA. During foul weather, median levels of audible noise from an existing 500-kV line at the ROW edge would be about the same (50 dBA).

BPA design criterion for median levels of audible noise during foul weather is 50 ± 2 dBA at the edge of the right-of-way. Transmission lines are classified as industrial and may cause a maximum permissible noise level of 60 dBA to intrude into residential property. During nighttime hours (10 p.m. to 7 a.m.), the maximum permissible limit for noise from industrial to residential areas is reduced to 50 dBA. This latter level applies to transmission lines that operate continuously. The state of Washington Department of Ecology accepts the 50 dBA level at

the edge of the right-of-way for transmission lines, but has encouraged BPA to design lines with lower audible noise levels (WDOE, 1981).

King County additionally defines a rural area where the maximum sound arising from an industrial area (say, a transmission line) is limited to 57 dBA, with a reduction to 47 dBA during nighttime hours and on weekends and holidays.

S.3.12.2 Electric and Magnetic Fields (EMF)

Transmission lines, like all electrical devices and equipment, produce EMF. While electric-field strength tends to be constant, magnetic-field strength can vary depending on the design of and distance from the line, the amount of electrical load on the line, and even meteorological factors. In all cases, field strength decreases rapidly with distance.

There are no national standards for EMF from power facilities such as transmission lines. Washington does not have a standard. BPA has an electric field standard of 9kV/m maximum on the ROW and 5kV/m at the edge of the ROW, which it applies to all transmission lines, including those already existing in the study area.

S.3.12.3 Toxic and Hazardous Substances

Because a transmission line and substations already exist in the project area, routine maintenance procedures for such facilities are already occurring. These generate minimal amounts of hazardous waste. BPA uses herbicides sparingly when managing vegetation in rights-of-way. All herbicides used by BPA must be approved by the EPA and must also go through a BPA environmental review process. Only trained crew members are allowed to apply herbicides, and they are required by law to follow label directions. BPA does not use herbicides in the Cedar River Watershed.

S.3.12.4 Fire

The City of Seattle permits fire suppression activities in the Cedar River Watershed and requires that activities in the Watershed follow strict fire control regulations. This policy is consistent with safe and reliable operation of the existing transmission lines.

The USFS and Weyerhaeuser require that vehicles traveling and working on their land carry fire suppression tools during the fire season. All BPA vehicles used for maintenance of transmission lines are equipped with such tools.

Fires on or near the ROW can jeopardize safe and reliable operation of transmission lines. Besides physical damage from heat and flames, smoke and hot gases from a fire can cause arcing between lines,

between lines and a tower, or between lines and the ground. Such occurrences can pose a threat to the safety of personnel in the vicinity, such as firefighters, and can result in line outages.

To prevent fires and other hazards, safe clearances are maintained between the tops of trees and the existing lines in the corridors. Electricity can arc from the conductor to a tree top. Generally, trees are not allowed to grow over 20 feet high on the ROW. Trees that need to be cleared from the ROW or that could cause such an arc are removed. BPA also prohibits storage of flammable materials on its ROWs.

For Your Information

Corona — Corona occurs in regions of high electric field strength on conductors, insulators, and hardware when sufficient energy is imparted to charged particles to cause ionization (molecular breakdown) of the air.

S.3.12.5 Radio/TV Interference

Corona on transmission-line conductors can generate electromagnetic noise in the frequency bands used for radio and television signals. The noise can cause radio and television interference (**RI** and **TVI**). However, correct design of a line can mitigate corona generation and keep radio and television interference at acceptable levels.

S.3.13 Air Quality

King County, inclusive of the project area, is designated as a marginal ozone maintenance area, a moderate carbon monoxide maintenance area, and a moderate particulate matter maintenance area. A maintenance area designation means that King County is not currently but was previously listed as a non-attainment area for these three pollutants but had not exceeded the National Ambient Air Quality Standard (**NAAQS**) for the three years prior to its designation as a maintenance area. Alternatives B and D cross over the Cascade Mountains and would be located in Kittitas County as well as King County. Kittitas County is an attainment area; the NAAQS are met for all criteria pollutants in Kittitas County.

S.4 Impacts

To analyze potential impacts from construction, operation and maintenance of the alternatives, resource specialists analyzed actions using a scale with four impact levels: **high**, **moderate**, **low** and **no** impact. The impact discussion also lists **mitigation** that could reduce impacts and cumulative impacts of the alternatives.

S.4.1 Land Use Impacts

The **Proposed Action** — would cross each of the main land uses in the area: forest production, watershed protection, and rural residential. The majority of land crossed would be forestland, where